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# **stream improvement**

Ontario Department of Lands and Forests



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**STREAM IMPROVEMENT**

*... an introduction to Stream Management*

1971

*SPORT FISHERIES BRANCH*



ONTARIO

*DEPARTMENT OF LANDS AND FORESTS*

Hon. Rene Brunelle, *Minister*

W.Q. Macnee, *Deputy Minister*

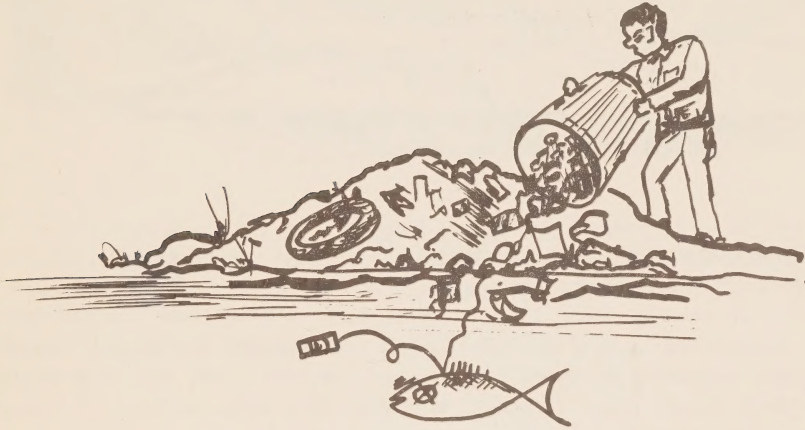


CONTENTS	PAGE
<i>Introduction</i> .....	3
<i>What Has Spoiled the Streams?</i> .....	3
<i>What Kind of Fish and Wildlife are Found in Ontario Streams?</i> .....	4
<i>What Role do Fish Play in the Ecology of a Stream?</i> .....	4
<i>Stream Improvement – Has it any Chance of Success?</i> .....	4
<i>Are Dams Good or Bad for Streams?</i> .....	6
<i>Stream Problems</i> .....	6
<i>What the Landowner Can Do</i> .....	8
<i>Department Duties</i> .....	12
<i>Department Objectives</i> .....	12

*Drawings by Claudette Krol*

## STREAM IMPROVEMENT

Although no actual measurement has been made, there are well over 100,000 miles of stream in Ontario. They represent a vast potential for fish production and recreation. Native brook trout still thrive in several thousand miles of southern Ontario streams that have survived the blunders of man. Largemouth bass, smallmouth bass, yellow pickerel (walleye), pike and maskinonge are also found in many rivers. Sturgeon, brook trout, rainbow trout, brown trout, kokanee, coho salmon, Atlantic salmon, smelt and suckers are essentially stream spawners — the young of these species normally spend an important development stage in the stream. Yellow pickerel populations spawn below the rapids in many streams. Pike and maskinonge often utilize the flooded vegetation on the banks of streams. A few populations of lake trout spawn in rivers.



## WHAT HAS SPOILED THE STREAMS?

Most of the activities of man have had adverse effects. The original clearing of the forest removed the shade and protection which formerly delayed the melting of snow, reduced the heating of surface water and prevented soil erosion.

Cultivation of the land led to erosion of the soil and silting of the streams. The effects were especially injurious in light soils.

Ditching and tilling of wetlands has removed many natural reservoirs and increased the amount and rate of surface run-off, which in turn has increased the frequency and severity of flooding.

Agricultural chemicals and natural fertilizers have upset ecological systems — often to the detriment of fish and wildlife.

Dams have blocked fish migrations to spawning grounds, exposed a greater amount of surface water to heating by sunlight, flooded out or silted over spawning and food producing places, and sometimes created stagnant pools.

The straightening and paving of stream beds (channelization) destroys fish and wildlife habitat, reduces aesthetic values, accelerates the flow of water and passes flood problems downstream. Quite often a single project of this nature may start a chain reaction downstream, forcing property owners to protect themselves.

Industrial, agricultural and domestic water consumption generally peaks during droughts which are critical periods for fish survival. Worst of all has been the use of streams as sewers.



## **WHAT KINDS OF FISH AND WILDLIFE ARE FOUND IN ONTARIO STREAMS?**

In unpolluted waters a wide variety of animals are found including microscopic zooplankton, clams, insect larvae, crayfish, snails, fish, mud-puppies, frogs, snakes, turtles, muskrat, beaver, and otter. Most wild creatures are frequent visitors to stream banks.

## **WHAT ROLE DO FISH PLAY IN THE ECOLOGY OF A STREAM?**

Fish that spend a considerable portion of their life span in streams form an important part of the energy and nutrient cycle. Almost all stream dwellers are carnivorous (flesh eaters) including the smaller species and young fry which feed on zooplankton and insect larvae. Predatory fish such as the brook and brown trout in cold waters, and the largemouth and smallmouth bass in warm waters, eat a wide variety of aquatic animals. In turn the fish are preyed upon by birds such as the kingfisher and heron, and mammals such as the mink and otter, as well as man.

## **STREAM IMPROVEMENT – HAS IT ANY CHANCE OF SUCCESS?**

Yes. Despite the fact that co-operation between government, industry and private landowners is required, there are good prospects for success. Annually, millions of dollars are being spent on soil and water conservation, flood and pollution control, lamprey eradication, recreational development, and reforestation. With proper co-ordination, most expenditures on these programs can also

result in the improvement of streams. Some of this co-ordination will be supplied through the program, planning and budgeting system (PPBS) gradually being applied in Ontario Government Departments.



It is anticipated that the biologists of the Department of Lands and Forests will effect the necessary field co-ordination with the Ontario Water Resources Commission, the Department of Food and Agriculture, Conservation Authorities, municipalities and private landowners. Most important to success is the increasing concern of the public for their environment.



## ARE DAMS GOOD OR BAD FOR STREAMS?

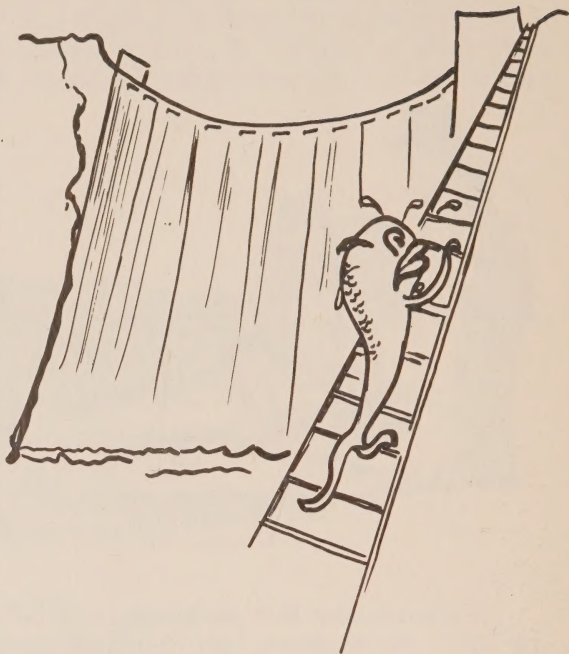
Dams can be either good or bad depending upon their location, design, operation and fish species involved. Very often, a dam negates any potential a stream may have as a trout or salmon fishery.

Brook trout undoubtedly grow faster and bigger in large ponds than in streams. However, if there is a lack of natural pools in a stream, they can be created by devices other than dams, which are less likely to block migratory fish movements, disturb feeding and spawning grounds, or expose more water to heating by sunlight.

Dams that actually deny the sea lamprey access to their spawning beds are important to the rehabilitation of the Great Lakes' fishery.

Similarly, dams that create deep, narrow and shaded reservoirs, while maintaining a steady flow of cold water, are equally acceptable. These dams, of course, should be equipped with good fish ladders.

The operation of dams can have profound effects on many fish species. The removal of stop logs in the spring and fall can permit the migration of trout and salmon to spawning shoals. Where yellow pickerel spawn in rivers below dams, a strong continuous flow is important during the spawning and incubating periods. Sometimes water drawdowns in the late fall leave trout and whitefish eggs high and dry.



## STREAM PROBLEMS

Once man has settled near a stream there is usually some need for stream improvement. Most likely, a high silt load, high summer water temperatures, lack of food and cover, pollution, obstruction or lack of flow are limiting the numbers or kinds of fish.

Scientists state that present land-use practices have increased the rate of sedimentation in the Great Lakes to fifty times the geological norm. Streams carry most of this load. In many farming communities, where cattle are not confined they muddy the streams by trampling the banks. In turbid waters, coarse fish have a decided feeding advantage over the sight-dependent varieties such as trout and bass.



Water temperatures over  $70^{\circ}$  are usually lethal to trout. In unpolluted streams, the principal source of heating is sunlight. The amount of heat absorbed is directly proportional to the exposed surface area of water. Therefore, a stream can be made cooler by reducing its exposed area. Increasing tree cover, deepening shallow pools and narrowing the width of streams are effective ways to reduce the exposed water surface.

If food is scarce under dense tree cover, sacrificing some trees can encourage the growth of grasses and other green vegetation. This in turn supplies a richer source of falling and hovering insects.

Good cover enables a fish to catch his food and avoid his enemies with less effort. A combination of shallow riffles and deep pools as well as sunlight and shade creates the light and dark patches favoured by sport fish.

Obstructions are never acceptable where they block fish migrations. It is generally more economical to remove such barriers than to build a fish ladder.

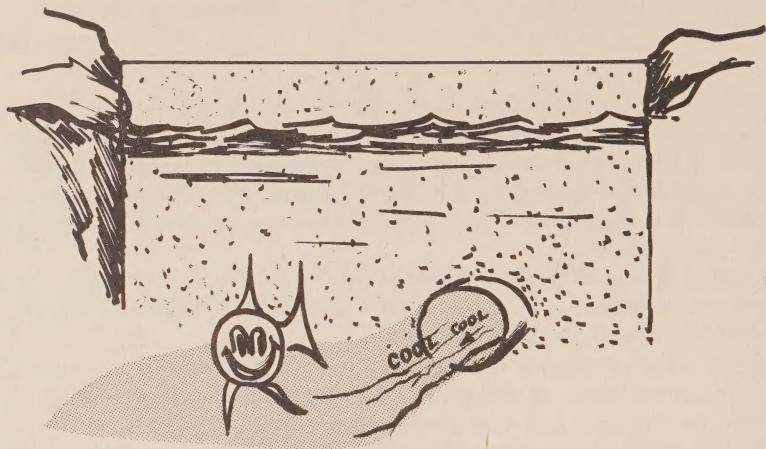


A considerable mileage of intermittent streams can be restored to year-round fish production by increasing the water-holding capacity of headwater run-off areas. Suitably planned reforestation can accomplish this.

## WHAT THE LANDOWNER CAN DO...

**Get approval and guidance before building or repairing water control structures.** If the structure is on an established water course, Department approval is required. This is to ensure safety and keep fish migration routes open. In many cases it is advisable to remove old dams.

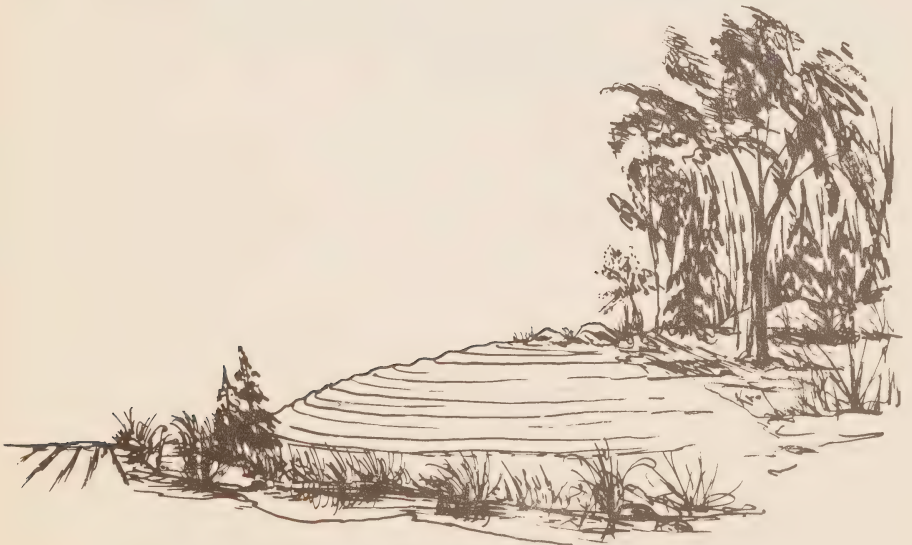
**Convert ponds to bottom draw-off.** These are specially designed outlet structures which pass cold water from the bottom of a pond instead of the warm water from the top. Technical advice should be obtained before installing such structures.



**Use wetlands as water reservoirs.** Swamps, marshes, bogs, stream banks and flood plains are not "worthless" lands. They form systems of natural water reservoirs maintaining ground water supplies, sustaining summer stream flow, and absorbing flood waters. Wetlands and their borders provide a home for many plant and animal communities; in some counties they are the last refuge of the whitetail deer. Hence, drainage of wetlands is generally a bad investment. Most of its advocates ignore the costs: lowered water tables, flash floods, reduced summer stream flow, dried out soils, and loss of fish and wildlife.



**Give the Stream room to live.** Through time the stream has developed its path and marked out the room it needs to handle peak flows. Rechanneling the bed, building dykes and putting the stream in a concrete straight jacket may give the local landowner some temporary advantage. However, downstream landowners are almost immediately obliged to protect themselves against faster water and high flood levels. The banks of a stream, the wetlands, and their immediate vicinity are hazard sites for building, ploughing, grazing, parking, and dumping. It is better to keep such areas natural with tree and other plant cover.



**Identify and treat erosion problems.** Muddy water and a silted bottom indicate an erosion problem. Loss of soil from cultivated fields can be reduced by contour ploughing, terracing and levelling, or by making other use of the particular field. Small gulleys may be filled in and planted with protective vegetation. Larger ones may be prepared for planting by reducing the steepness of the banks. The idea is to slow down the cutting action of run-off water and to protect the surface of the soil. Trees, shrubs and grasses in varying combinations can be used to provide shelter from the erosive forces of wind and water. Similarly, small watercourses and ditches may be treated in the same way.

**Control Cattle.** The grazing and watering of cattle often causes severe damage to the banks and beds and lowers the quality of water in streams. To prevent this, ideally, the water should be taken to the cattle. If this is not possible, limit cattle access to a portion of the stream with a shallow slope and a gravel bottom.



**Use chemicals with care.** No chemical may be applied to any watercourse (drainage area) without complying with the requirements of the Ontario Water Resources Commission. The landowner should use only the minimal quantities of the necessary chemical. Clean equipment well back from all watercourses.

**Prevent pollution.** Garbage should never be dumped on wetlands, stream banks or floodplains. Sewage and seepage from septic tanks and barnyards must never be allowed to drain into streams. Report all suspected pollution at once to your local Department office or the Ontario Water Resources Commission.

**Develop alternate water reserves.** Landowners having permission to withdraw large quantities of water from a stream should try to develop alternate water reserves and become less dependent upon the stream — especially in drought periods. This can be done by digging additional wells and creating large volume storage to be filled in periods of abundant water.



**Keep surplus land in tree cover.** In circumstances where land is not going to be farmed, the planting of trees and shrubs offers an alternative use providing shelter and food for wildlife. In many situations improved water storage, flood control and constant stream flow will be added benefits. In all cases reforestation increases the value of the property.

## DEPARTMENT DUTIES

Under The Game and Fish Act the Department is responsible for "...the management, perpetuation and rehabilitation of the wildlife resources in Ontario".

Under the Lakes and Rivers Improvement Act:

"No person shall construct a dam on any lake or river, (a) until the location of the dam has been approved by the Minister; and (b) until the plan and specification thereof have been approved in writing by the Minister."

Fishing in Ontario is controlled by the Fisheries Act (Canada) and the Ontario Fishery Regulations which are administered by the Department. In addition Department staff assist as agents for the Ontario Water Resources Commission in the detection of pollution and in monitoring corrective action.

## DEPARTMENT OBJECTIVES

The objectives of the Department are to maintain and improve all waters including streams; to provide a high level of fish production; and to expand fishing opportunities for the people of Ontario.

Under the Department's stream easement program, long stretches of stream bank are being made accessible for public fishing.

In southern Ontario extension biologists of the Department may be consulted on the maintenance and improvement of fish and wildlife habitat.

Landowners who wish to receive additional assistance, may enter into agreements with the Minister of Lands and Forests.

For further information on stream improvement landowners are requested to apply to the nearest Lands and Forests office.





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